

TACTIC

Tools for Assessment of Climate change Impact on Groundwater and Adaptation Strategies

Final GeoERA meeting
January 19 2022



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 731166



TACTIC Objectives



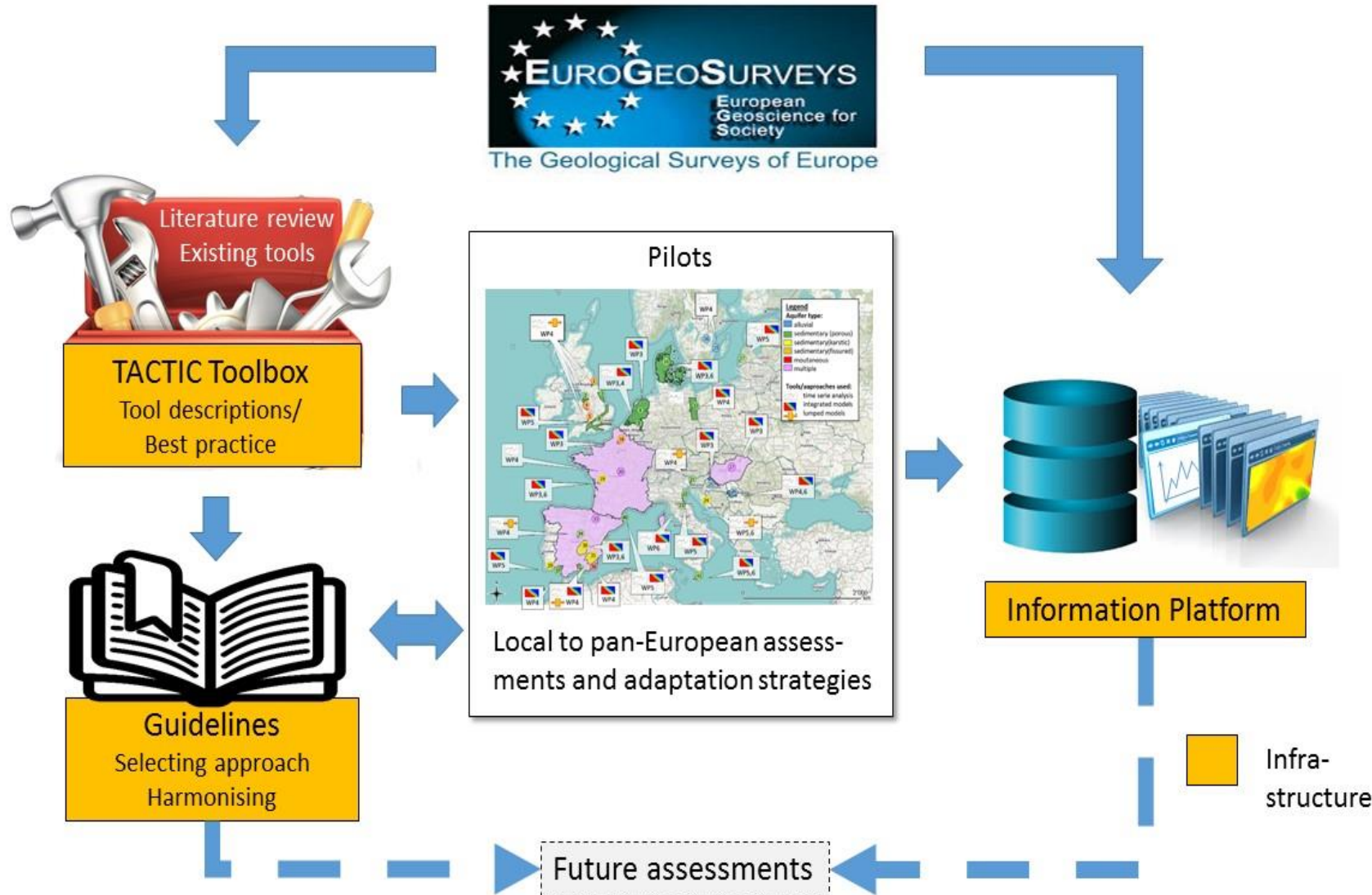
To contribute to the development of coherent and transparent assessments of climate change (CC) impacts on groundwater (GW) and surface water, supporting improved EU policy making, and providing decision support for stakeholders and decision makers

- identify and **collect readily available data**
- **easy access to maps, data and results** collected or produced during the assessments carried out in TACTIC via GeoERA Information Platform
- **knowledge sharing** among the GSOs on tools and models to support a larger uptake of the tools by the GSOs
- **Develop guidelines** describing available tools, data requirements
- **Demonstrate the use of tools to assess climate change impact and adaptation strategies** in pilots covering various challenges, hydrogeological conditions and geographical areas to provide transnational assessments



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TACTIC
GROUNDWATER

TACTIC Concept



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Tool overview

TACTIC tool template for assessment of CCA and CCA effects		Functionality		Tool type		Intended users / user friendliness		Scale		User rights and access		Extent of documentation		Relevance for TACTIC		Transferable to other sites?																		
Partner	Tool name	Impact assessment	Adaptation assessment	Climate projection and bias correction	Supporting tool	Physical based integrated GW-SW	Lumped numerical model	Analytical model	Conceptual model	Time-series analysis	Index based	Scientists	Professionals (e.g. consultants)	Water managers – CCA – DRR	Stakeholders	Downstream services – General public	Catchment	Aquifer	Wellfield local	Property codes	Open source	Freely accessible at no cost	Not documented	Documented	User guide	User guide and hotline	Groundwater dependent floods and droughts	Groundwater-Surface water interaction	Changes in groundwater recharge	Groundwater depletion	Salt water intrusion	Generic (transferable to different sites and used in the TACTIC project)	Non-generic (not transferable to other sites)	
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Structured overview

- Functionality
- Type
- User
- Scale
- Access
- Documentation
- Relevance TACTIC
- Transferrable

Tool description

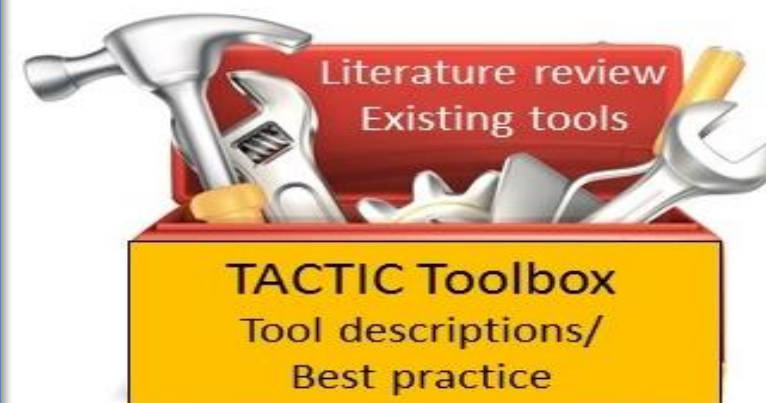
TACTIC tool factsheet	AquiMOD
Description of tool	AquMod is a simple, lumped-catchment groundwater model. It simulates groundwater level time-series at a point by linking simple algorithms of soil drainage, unsaturated zone flow and groundwater flow. It takes time-series of rainfall and potential evapotranspiration as input, and produces a time-series of groundwater level. Hydrographs of flows through the outlets of the groundwater store are also generated, which can potentially be related to river flow measurements.
Required data	Rainfall Potential evaporation Groundwater level time series
Strength	Fast simulation of groundwater level time-series. User defined time stepping for flexibility. Monte Carlo parameter sampling. Modular structure with multiple process representations. Choice of objective functions to evaluate model efficiency.
Weaknesses	Lumped (not distributed) groundwater model Point calculation Over all representation of catchment characteristics
Examples of uses of tool	Monthly Hydrological Summary The National Hydrological Monitoring logical Summary of the UK. during the preceding and National Gr mary-uk me (NHMP) produces the month rt describes the hydrologi ta holdings of the Nati https://nfta.co.uk

Fact sheet

- Brief description
- Required data
- Strengths
- Weaknesses
- Examples
- Links

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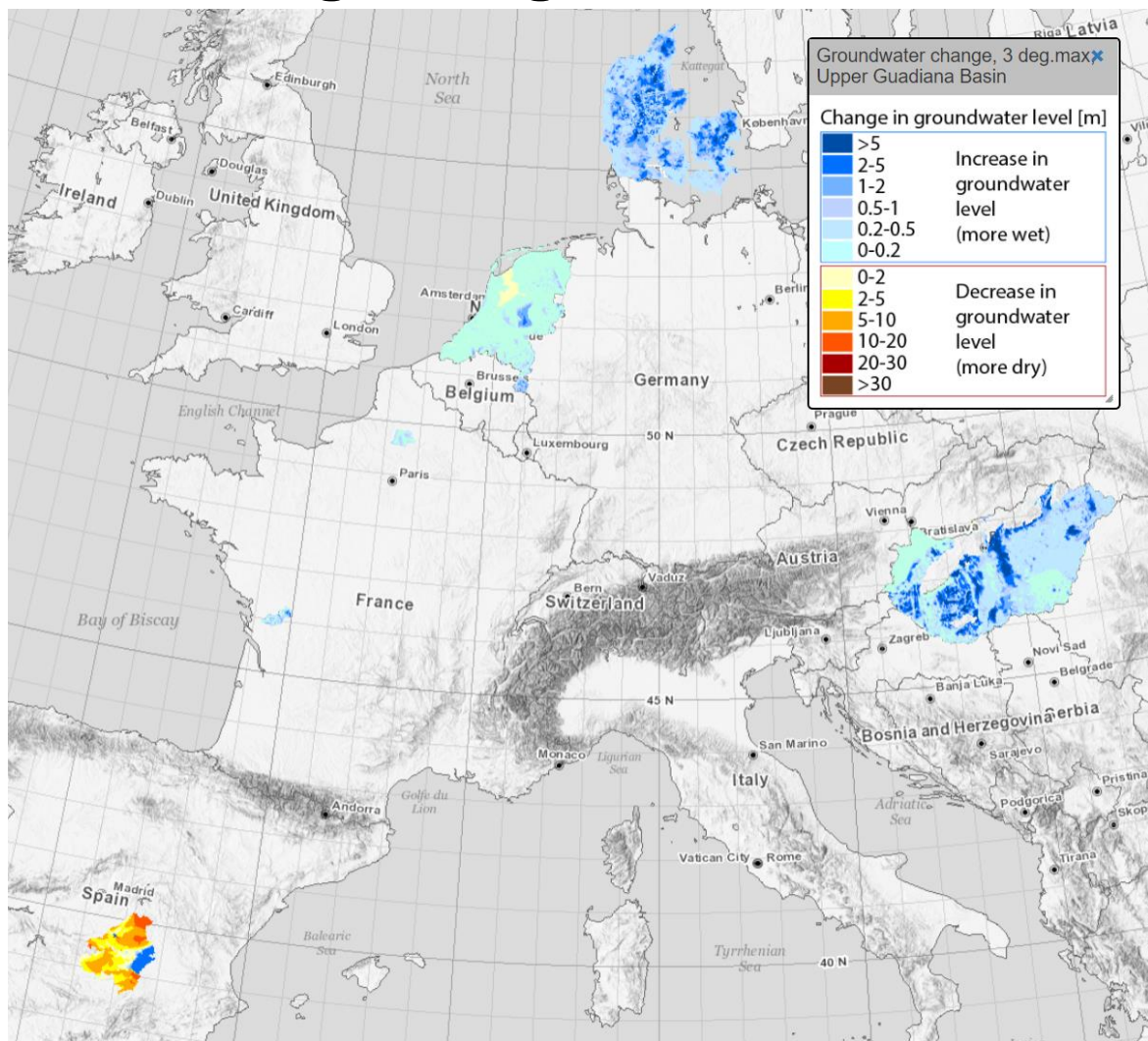


**57 tools shared among
GeoERA partners via
EGDI**



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WP3: Integrated groundwater - surface water assessment of climate change



Applying integrated models to assess impact of climate change on groundwater across Europe

Generate Standard TACTIC CC scenarios – make comparable Pan-European studies.

- Propagate results from ensemble through impact models (integrated GW/hydrological models)
- Assess future GW conditions by comparing with historical (referencing)
- Propose standard storing of GW impact results (GIP)



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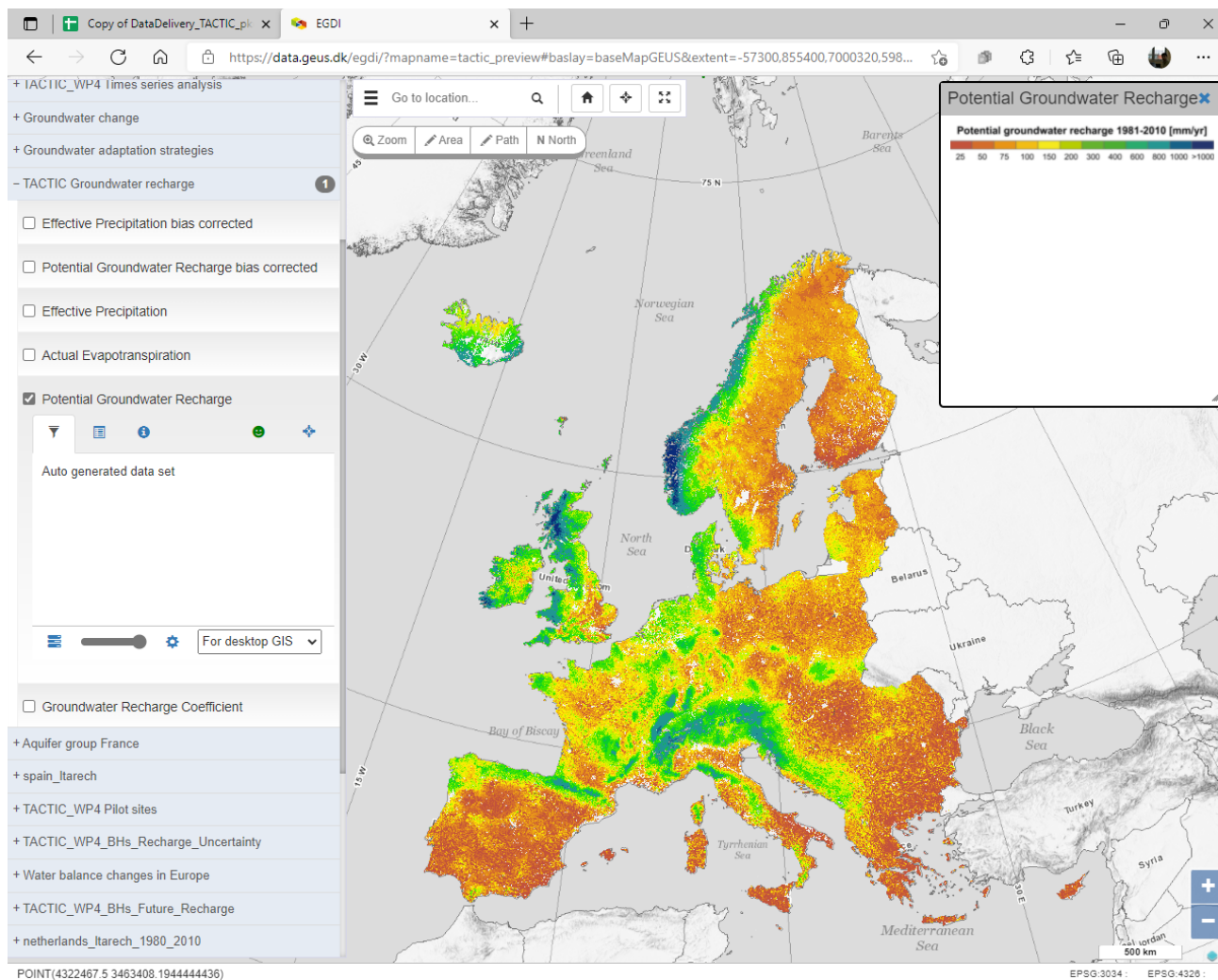
WP4: Assessing groundwater recharge and vulnerability to climate change



Pan-European Potential Recharge map

Produced from local and national GSO supported models and data

Combined to European scale map by Remote sensing and Machine learning



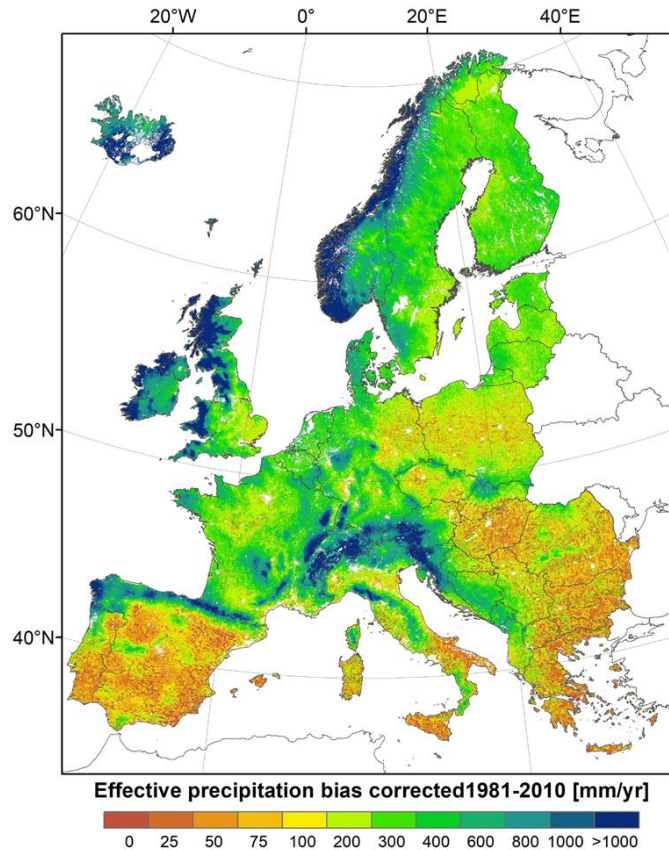
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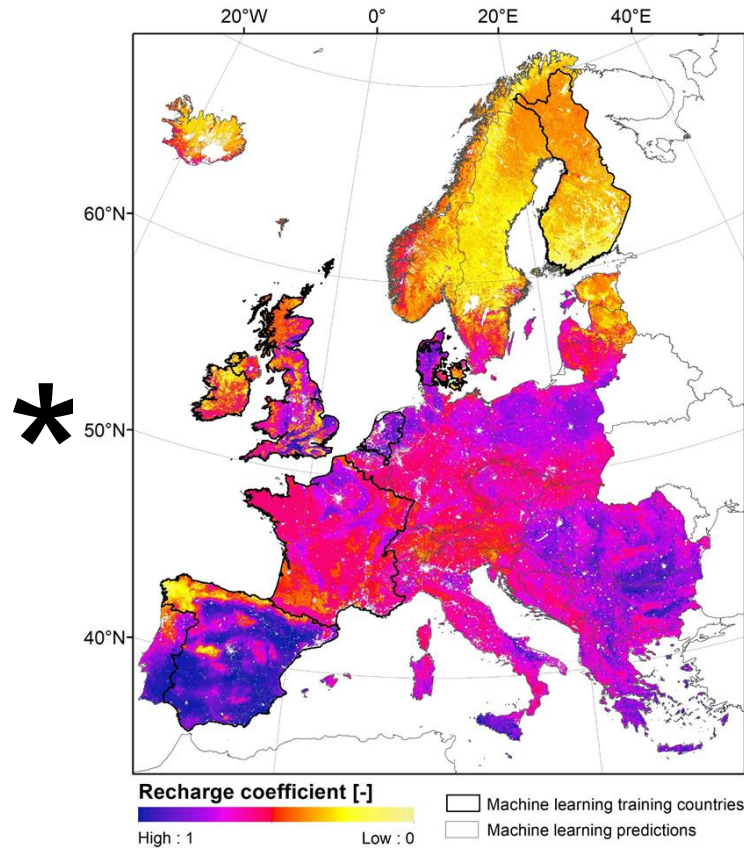
PAN-EUROPEAN GROUNDWATER RECHARGE MAP

effective precipitation bias corrected * recharge coefficient = Potential groundwater recharge

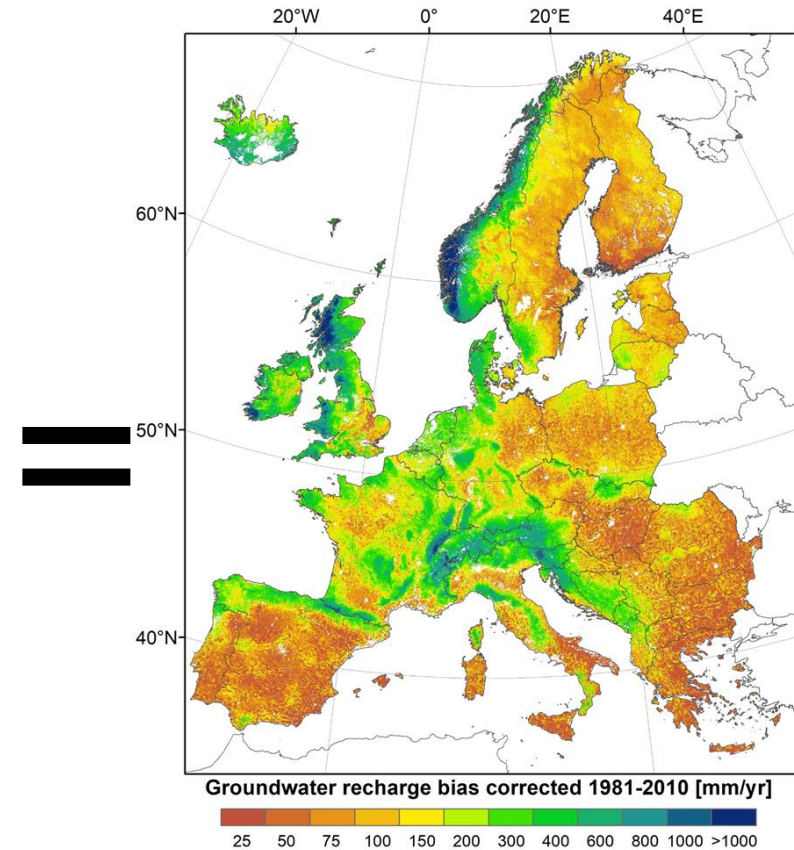
Remote sensing data aided



Machine learning generated data trained on national data sets



Potential Recharge

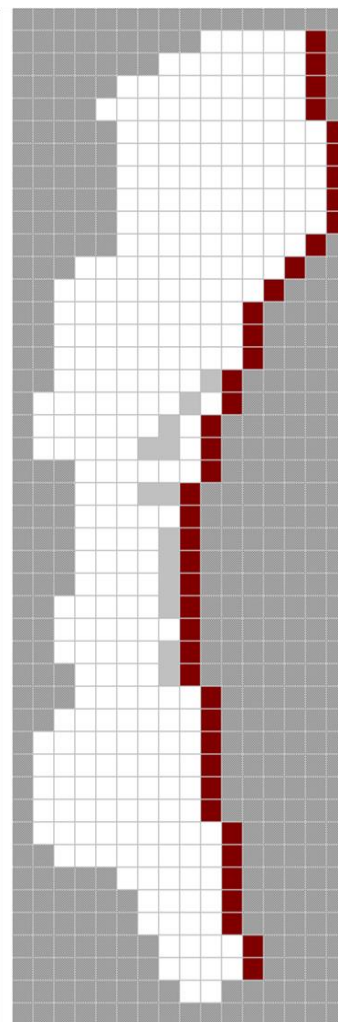
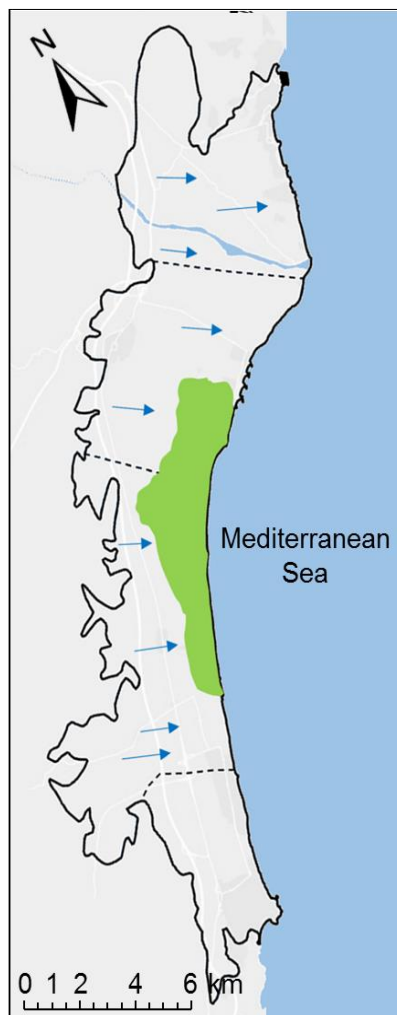


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WP5: Assessment of salt-water intrusion (SWI) status and vulnerability



- Municipal sector
- Plana de Oropesa-Torreblanca aquifer
- Prat de Cabanes Natural park
- Flow direction under natural conditions
- Constant potential (coast line)
- Drainage cells
- Inactive cells



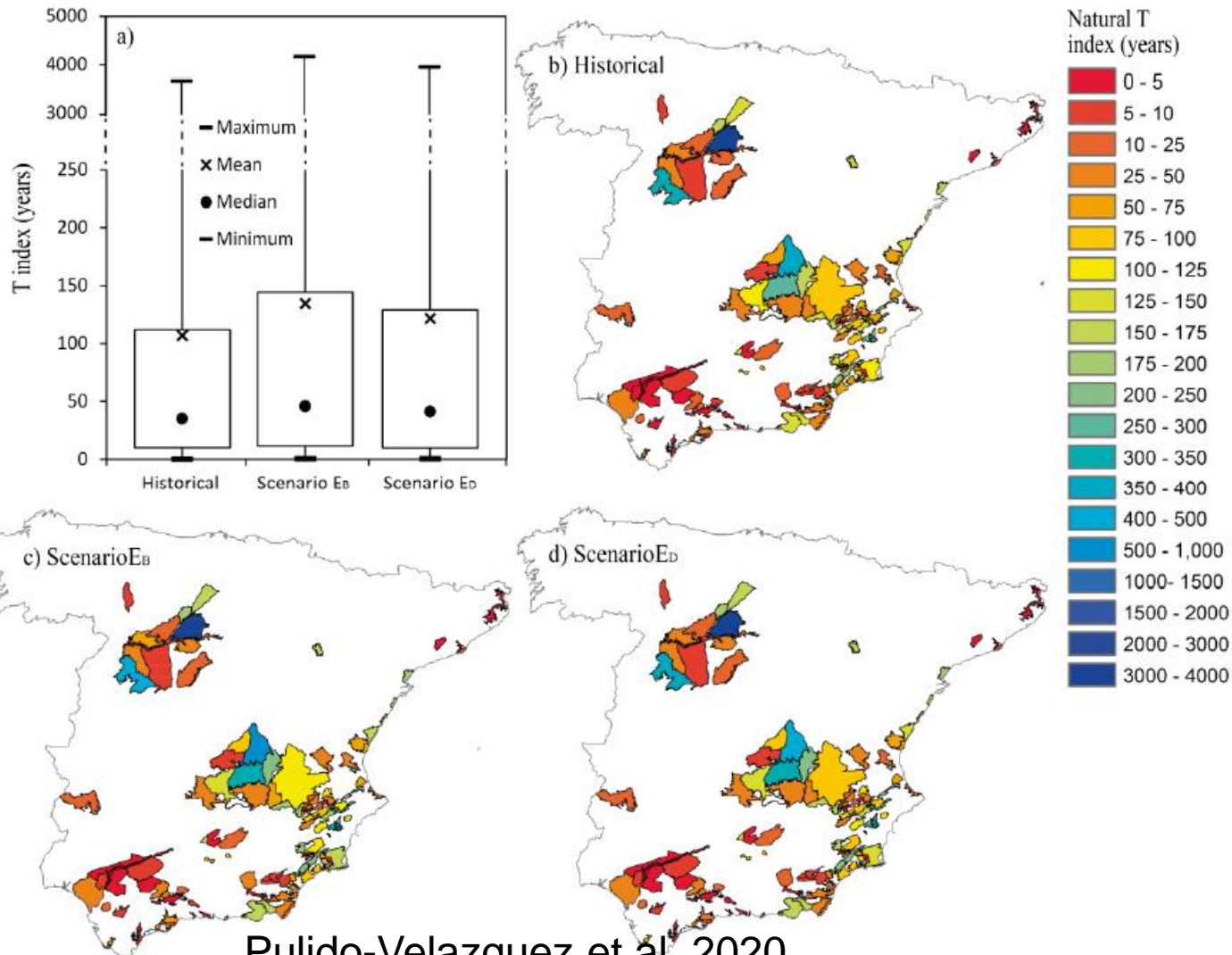
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Climate change impacts
on sea level rise, salt
water intrusion and coastal
vulnerability



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WP6: Groundwater adaptation strategies



Sustainable management of droughts
in water scarce areas

By identification of aquifers
with resilience to precipitation changes

Pulido-Velazquez et al. 2020

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WP6: Groundwater adaptation strategies

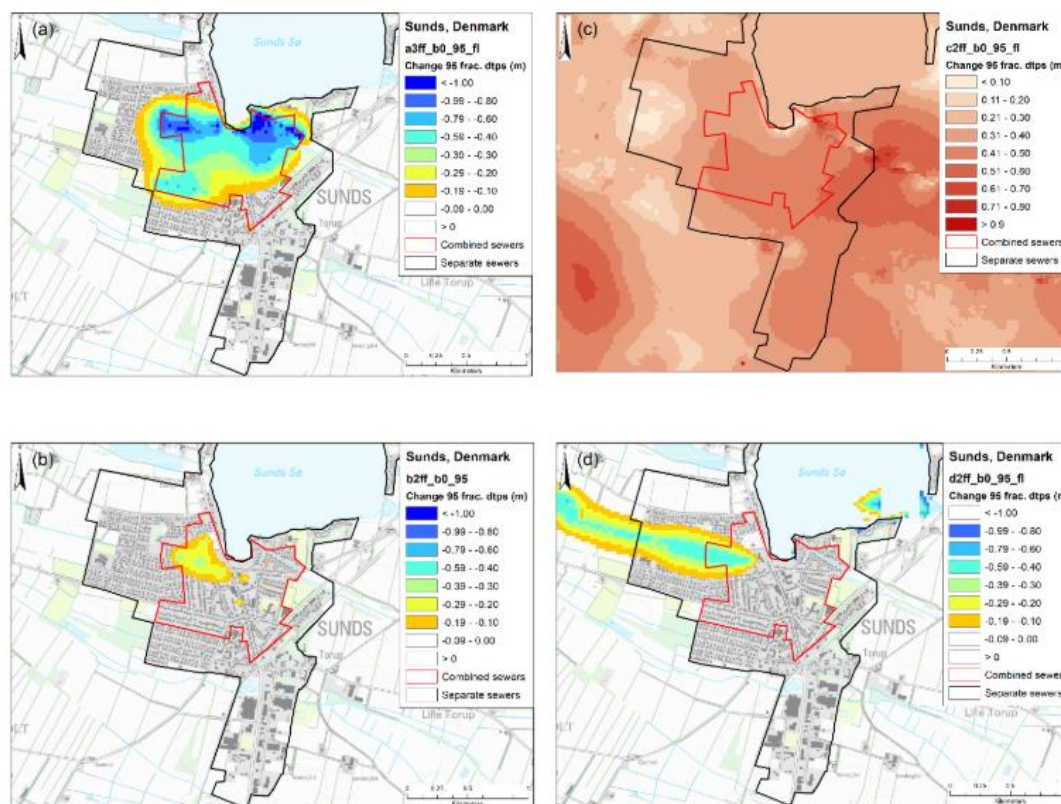


Fig. 8 Climate change robustness of the four adaption measures, figures show change in depth to phreatic surface (dtps) for far future dtps (95% percentile) minus historic dtps (95% percentile): (a) 3 pipe, (b) pumping/ injection, (c) new forest, and (d) new ditch

Rasmussen, Kidmose et al. 2022

Adaptation to future groundwater flooding

Multiple adaptation strategies tested and evaluated



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Thanks to the TACTIC team !
Operational results and 15 + scientific publications !



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